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PAGES: 348-355

ORIGINAL PDF URL: <https://dergipark.org.tr/tr/download/article-file/1001006>

How does the environmental knowledge of Turkish households affect their environmentally responsible food choices? The mediating effects of environmental concerns

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Abstract

The main objective of the present study is to examine whether Turkish households' environmental knowledge effects environmentally responsible food choices through the mediating effect of households' environmental concerns. A face-to-face survey was conducted, resulting in 450 responses from households that have recently chosen environmentally responsible foods in Erzurum, Turkey. The hypotheses were tested using the partial least squares-based structural equation modelling (PLS-SEM) technique to detect how the mediating role of environmental concerns plays in the relationships between environmental knowledge and households' environmentally responsible food choices. The findings confirm that environmental knowledge and environmental concerns positively and significantly enhance households' environmentally responsible food choices. It is also the first study to examine the mediational effect of environmental concerns on environmental knowledge and households' environmentally responsible food choice relations. The findings of the study and its implications are expected to benefit the development of environmentally responsible foods in the Turkish food industry.

Keywords: Environmental knowledge, Environmental concerns, Environmentally responsible food choices

Introduction

In recent years, households' interest in environmentally responsible foods has increased significantly. For example, organic food consumption on a global scale reached \$97 billion in 2017 (Willer and Lernoud, 2019). It is estimated that this figure will increase to approximately \$323.56 billion by 2024 (Chauke and Duh, 2019). Ninety per cent of environmentally responsible foods are demanded by developed countries (Chauke and Duh, 2019). Environmentally responsible food awareness and demand for these products are also increasing in developing countries (Asif et al., 2018). For example, many stores have recently opened in Turkey which sell environmentally responsible foods like organic and eco-labeled. This can be considered as an important indicator of the increase in

households' interest in environmentally responsible foods.

On the other hand, according to the European Commission (2005) "food consumption is one of the most important areas where environmental sustainability can be improved as it is responsible for one third of a household's total environmental impact" (cited in Eldesouky et al., 2020, p. 65). There are many studies in the literature on environmental information, environmental concerns and environmentally responsible food choices (e.g. Haron, Paim and Yahaya, 2005; Peschel et al., 2016; Suki, 2016; Zareie and Navimipour, 2016; Lin and Niu, 2018). However, most of these studies have focused on developed countries as the demand for environmentally friendly food is in developed countries. However, the widespread use of environmentally responsible foods in developing countries

Cite this article as:

Başar, Ş., Başar, E.E. (2020). How does the environmental knowledge of Turkish households affect their environmentally responsible food choices? The mediating effects of environmental concerns. *Int. J. Agric. Environ. Food Sci.*, 4(3), 348-355

DOI: <https://doi.org/10.31015/jaefs.2020.3.14>

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Received: 11 March 2020 Accepted: 14 August 2020 Published Online: 15 September 2020

Year: 2020 Volume: 4 Issue: 3 (September) Pages: 348-355

Available online at : <http://www.jaefs.com> - <http://dergipark.gov.tr/jaefs>

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increases the research need on this subject in developing countries. In addition, studies on households' environmentally responsible food choices in Turkey, which is an important food manufacturer, are expected to provide important information.

The current study aims to fill a gap in the literature about the relationship between environmental information, environmental concerns and households' environmentally responsible food choices in Turkey. Previous studies have examined direct and indirect relationships between environmental knowledge and sustainable choices (e.g. Haron et al., 2005; Pescel et al., 2016), environmental knowledge and pollution concerns (e.g. Tong et al., 2020), and environmental concerns and purchase intentions (e.g. Shamsudin et al., 2018). The current study provides the first empirical evidence of the direct relationship between environmental knowledge and environmentally responsible food choice. In addition, the role of environmental

concerns as a mediator variable was examined for the first time in the relationship between environmental knowledge and environmentally responsible food choice.

Construct definition and research hypotheses

Households' environmental knowledge is believed to be a determinant of their environmentally responsible food choices. Furthermore, households' environmental concerns may enhance the impacts of environmental knowledge on their environmentally responsible food choices. Therefore, environmental concerns should be considered as a mediator variable in the research framework (see Fig. 1). Environmental concerns are thus the third variable that represents the reproductive mechanism through which the centric independent variable (i.e. environmental knowledge) is able to affect the dependent variable (i.e. environmentally responsible food choices) in this hypothetical relation.

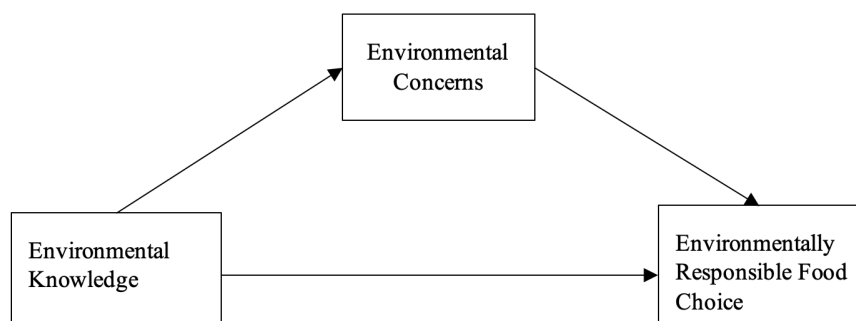


Figure 1. The research framework

Environmentally responsible food choice directly affects households' quality of life. In this respect, it can differentiate from other sustainable consumption dimensions (i.e. waste generation and recycling, personal transport choice, residential energy demand, residential water use) (Başar, 2018). For example, reducing household energy demand may not directly affect individuals' quality of life, or even consuming less energy can be perceived as a factor that decreases the quality of life. However, environmentally responsible food choice improves the quality of life by helping households to protect their own health (Kareklas, 2014). In this regard, it can be said that environmentally responsible food choice has emerged as a result of individuals' concerns about health. When individuals do not choose environmentally responsible foods they are primarily affected by the consequences of this (Saxe, 2014).

Previous research on environmentally responsible behavior has assessed various factors that influence such behavior, such as environmental knowledge. The importance of knowledge in consumers' environmentally responsible behavior has been examined in numerous studies. For instance, Thøgersen et al. (2010) have examined the effect of consumer knowledge relative to consumers' environmentally responsible behavior. Especially, consumers who had at one time purchased environmentally responsible products have been observed to show a greater likelihood of choosing products with a lower carbon footprint. According to Safari et al. (2018), consumer

knowledge about an issue impacts significantly upon decision making. In particular, people dislike, and hence tend to abstain from situations where they do not have enough information to guide their behavior and where there is a high probability of confusion. This explains why some people may prefer not to accept sustainable consumption activities such as involvement in reducing residential energy demand because they feel they do not know enough about reduction (Haron et al., 2005). On the other hand, Diamantopoulos et al. (2003) argue that consumers having high-level environmental knowledge may not necessarily lead to the development of positive environmentally friendly behaviors. It has also been discussed, moreover, that there was not a significant correlation between environmental knowledge and environmentally responsible behavior (Oğuz et al., 2010).

As seen, there is no consensus in the literature as to how environmental knowledge affects environmentally responsible behavior. Therefore, more empirical evidence is needed on this issue.

Against this background, this study aims to assess the impact of environmental knowledge on environmentally responsible food choices via one hypothesis:

H1: Households' environmental knowledge directly and positively effects their environmentally responsible food choices.

Environmental concerns

Another important motivational factor towards households' environmentally responsible food choices is environmental concerns. According to Hines et al. (1987), the basis of environmental researches is the individual's concerns for the environment (cited in Kim and Choi, 2005, p. 593). Environmental concerns, referring to an individual's general orientation toward environmental issues, have been found to be a useful predictor of environmentally responsible behavior (Chen, 2019; Saleh and Danmaliki, 2020; Sanchez-Sabate and Sabaté, 2019; Shamsudin et al., 2018). Ling (2013), in his paper, has analyzed the intentions of young consumer groups to buy eco-friendly food products. The findings showed that young consumers demonstrated more altruistic motivations and more concern towards eco-friendly foods. Environmental concerns should be included as a mediator that intervenes with the independent variable (i.e. environmental knowledge levels) and the dependent variable (i.e. environmentally responsible food selection). The basic reasoning behind this is that though households may have high-level environmental knowledge, environmentally responsible food may not be easily chosen if households cannot objectively or will not subjectively undertake environmental concerns. Some people may have high-level environmental knowledge but are not willing to consume environmentally responsible foods due to the higher price of these foods (Başar, 2018; Chen, 2009). In other words, although environmental knowledge and environmental concerns are correlated, some people still follow an environmentally unconcerned lifestyle even if they have high-level environmental knowledge (Chen, 2009). This means that the positive relationship between environmental knowledge and environmentally responsible food choices will be enhanced if households have environmental concerns.

Based on the above, the following hypotheses are proposed:

H2: Households' environmental knowledge directly and positively effects their environmental concerns.

H3: The positive relationship between households' environmental knowledge and environmentally responsible food choices is mediated by households' environmental concerns.

Research method

Questionnaire design

The survey instruments for each of the constructs were designed to gather exhaustive details and were adapted from the literature, including environmental knowledge - 14 items (Haron et al., 2005); environmental concerns - five items (Kim and Choi, 2005); and environmentally responsible food choice - seven items (Başar, 2016). The seven-point Likert-type scale was used to measure the responses.

Survey administration

This research was based on a face-to-face survey. The survey was conducted with 450 randomly chosen households of Erzurum, Turkey. To qualify for this survey, respondents had to buy environmentally responsible foods such as organic and eco-labeled food products and/or dairy products from local producers in recent months (≤ 12 months) and had to be at least 18 years old.

Data analysis

Partial least squares-structural equation modelling (PLS-SEM) was used to determine the causal relationships for theory confirmation in this study. In the analysis of the data, the SmartPLS 3 and SPSS 25 software was used.

Results

The sample consisted of 230 males and 220 females. The sample's average age was 41 (standard deviation = 9.78). A large percentage of the samples were married (90%). The average monthly income of samples was 6000 TL (standard deviation = 10.65). Most households (76%) had undergraduate degree qualifications.

The Cronbach's alpha (CA) value is more than 0.75, indicating good internal consistency for each of the constructs. Composite reliability values for all the constructs were satisfactory (>0.65). Both test results confirmed the internal consistency and reliability of the measures.

By examining the outer loadings of the items in each of the constructs, convergent validity was ensured.

According to Hair et al. (2014), an outer loading <0.40 should be eliminated and values >0.70 are acceptable. For all that, all item loadings were statistically significant (t-value >1.96 ; Fig. 2).

Examining the Fornell-Larcker criterion, the heterotrait-monotrait (HTMT) ratio and cross-loadings of items were used to ensure discriminant validity. First, the Fornell-Larcker criterion was used. Accordingly, the square root of the AVEs of all constructs should be greater than the highest correlation value for other constructs. Table 1 shows convergent and discriminant validity test results (Hair et al., 2014).

As seen in Table 1, the square root of the AVEs of all constructs should be greater than the highest correlation value for other constructs (Sultan et al., 2020). Thus, discriminant validity has been established.

Second, the heterotrait-monotrait ratio of correlations (HTMT) was also used in assessing the discriminant validity of reflective constructs.

As seen in Table 2, none of the HTMT values of the constructs exceeded 0.90 (Henseler et al., 2015). Hence, discriminant validity has been established between reflective constructs.

Third, the "cross-loadings of items (Appendix 1), where item loadings for their own constructs are relatively higher than loadings for the other constructs, confirming the discriminant validity of the items" (Sultan et al., 2020: 5).

Fig. 2 shows that environmental concern explains 64% of the variance of environmental knowledge and that environmentally responsible food choice explains 13% of the variance of the independent constructs. Both constructs are statistically significant ($p < 0.05$). The normalized fit index is 0.75 (value closer to 1). The standardized root mean square residual value is 0.06 (value <0.08). The goodness-of-fit value, the square root of the product of average AVE and average R^2 , which is 0.498 (value >0.36), is considered satisfactory for model fit indices, confirming the predictive validity (Hair et al., 2014).

The relationships among the three main variables must be tested and satisfy the following four conditions: (a) environmental knowledge (the independent variable) significantly

influences environmentally responsible food choice (the dependent variable); (b) environmental knowledge significantly influences environmental concerns (mediator); (c) environmental concerns (the mediator variable) significantly influence environmentally responsible food choice (the dependent variable); and (d) the impact of the independent variable on the dependent variable must be reduced or must become statistically insignificant after controlling for the effect of the mediator. If

the first three conditions are significant and the relationship between environmental knowledge and environmentally responsible food choice is still significant but reduced, this is called “partially” mediated. But if the relationship between environmental knowledge and environmentally responsible food choice is not significant, the effect of environmental concerns is called “fully” mediated.

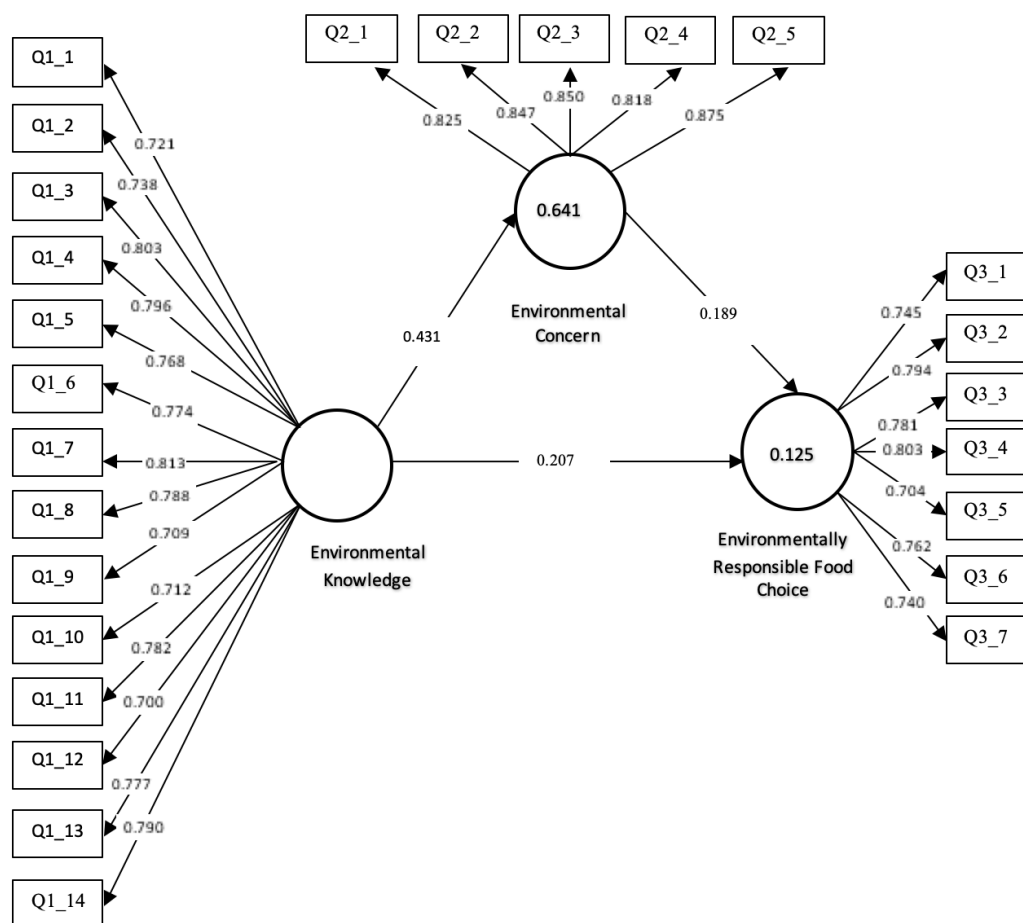


Figure 2. The structural model with outer loadings and path coefficients

Table 1. Convergent and discriminant validity test results

	CA	CR	AVE	01	02	03
Environmental Knowledge	0.852	0.965	0.601	0.775		
Environmental Concern	0.870	0.959	0.693	0.768	0.832	
Environmentally Responsible Food Choice	0.789	0.823	0.647	0.691	0.375	0.804

CA = Cronbach's alpha; CR = Composite reliability; AVE = Average variance extracted

Table 2. Heterotrait-monotrait ratio of correlations (HTMT)

	Environmental Knowledge	Environmental Concern	Environmentally Responsible Food Choice
Environmental Knowledge	-		
Environmental Concern	0.469	-	
Environmentally Responsible Food Choice	0.680	0.672	-

The results show that environmental knowledge positively effects environmentally responsible food choice ($\beta = 0.21$, p value <0.001), implying that H1 is supported. It is also found that environmental knowledge positively effects environmental concern ($\beta = 0.43$, p value <0.001), hence supporting H2. Also, environmental knowledge–environmental concern is stronger than other path coefficients in the model. All path coefficients are statistically significant, using all data set bootstrap samples in the 95% confidence interval (casual hypotheses are confirmed; Table 3).

Regarding the mediating effects of environmental concern on the association between environmental knowledge and environmentally responsible food choice, the indirect results

show a significant indirect effect ($\beta = 0.200$, p value <0.05). This finding, along with the fact that the direct effect between environmental knowledge and environmentally responsible food choice is still significant but decreased, as in the basic model, suggests that environmental knowledge directly and indirectly affects environmentally responsible food choice via environmental concern. These results offer empirical support for H3, suggesting that the relationship between environmental knowledge and environmentally responsible food choice is partially mediated by environmental concern. Furthermore, Table 3 shows the mediating effect of environmental concern in the model.

Table 3. Hypotheses and mediation test results

Causal hypotheses	β	t	p	Results
H1	0.207	3.421	0.000	Accepted
H2	0.431	10.879	0.000	Accepted
Mediation test				
H3 Direct effect	0.200	3.402	0.001	Partial mediation effect
Indirect effect	0.053	2.461	0.012	

Discussion, Limitations and Future Directions

The aim of the present study is to examine the mediating effect of households' environmental concerns on environmental knowledge and environmentally responsible food choice relationships. Thus, the current study proposed two causal and one mediating hypothesis. This study validated the research framework and found statistically significant results for all hypotheses, using the PLS-SEM technique. In summary, the results show positive and significant effects of environmental knowledge ($\beta = 0.207$, $p < 0.01$) and environmental concern ($\beta = 0.431$, $p < 0.01$) on environmentally responsible food choice, supporting H1 and H2. These results offer empirical support for the findings of related research (e.g., Bazoche et al., 2013; Bezawada and Pauwels, 2013; Scalvedi, 2018; Heo and Muralidharan, 2019; Tong et al., 2020), suggesting that households having environmental knowledge and environmental concern tend to choose environmentally responsible foods that in turn can lead to sustainable consumption.

The mediation test results show that environmental concern has a partial-mediation effect between environmental knowledge and environmentally responsible food choice relationships, confirming H3. This result offers novel findings for

several reasons. Environmental knowledge itself is found to be sufficient in raising households' environmentally responsible food choices. However, the mediation test results clearly point to the importance of the indirect effect role, including that for environmental knowledge which raises households' environmentally responsible food choices through environmental concerns. Previous studies attempting to explain households' environmentally responsible food choices (e.g. Yu et al., 2014, Zhu et al., 2013) have been addressed in single-equation models and led to largely biased predictions. The PLS-SEM application used in the current study contributes to the literature methodologically by revealing two direct and one indirect pathway in which observed and latent variables interact in explaining households' environmentally responsible food choices (Tong et al., 2020). A possible explanation of the partial mediation may be due to the role of other factors, such as income, regulations, and/or best practices, in encouraging households to strengthen their environmentally responsible food choices.

This research supplies new evidences on the roles that households' environmental knowledge, and environmental concerns play in Turkish households' environmental responsible food choices. However, the sample size of the work is

Appendix 1. Cross-loadings of items

Items	Environmental Knowledge	Environmental Concern	Environmentally Responsible Food Choice
Q1_1 All living things play an important role in maintaining balance in the ecology	0.721	0.512	0.603
Q1_2 Natural resources should be conserved for future generations	0.738	0.500	0.614
Q1_3 The condition of our environment can affect our health	0.803	0.534	0.623
Q1_4 Destruction of forests will cause biological imbalances	0.796	0.525	0.701
Q1_5 There is an abundance of natural resources that can never be depleted	0.768	0.565	0.687
Q1_6 The main cause of air pollution in our country is fumes from vehicles	0.774	0.545	0.694
Q1_7 Most rivers in our country are polluted	0.813	0.516	0.642
Q1_8 Our country is faced with serious solid waste (garbage) and landfill problems	0.788	0.601	0.709
Q1_9 Alternative energy, e.g. solar energy can be utilized in place of electricity	0.709	0.574	0.638
Q1_10 The natural environment should be sacrificed in the name of development	0.712	0.541	0.687
Q1_11 Usage of disposable goods should be encouraged as it provides convenience to consumers	0.782	0.597	0.691
Q1_12 Unleaded petrol is better than leaded petrol as it is less harmful to the environment	0.700	0.571	0.672
Q1_13 Using public transport can help alleviate air pollution	0.777	0.634	0.688
Q1_14 Vehicles improperly maintained will cause pollution	0.790	0.593	0.675
Q2_1 I am extremely worried about the state of the world's environment and what it will mean for my future	0.698	0.825	0.532
Q2_2 Mankind is severely abusing the environment	0.691	0.847	0.593
Q2_3 When humans interfere with nature it often produces disastrous consequences	0.703	0.850	0.631
Q2_4 The balance of nature is very delicate and easily upset	0.661	0.818	0.633
Q2_5 Humans must live in harmony with nature in order to survive	0.671	0.875	0.644
Q3_1 I can pay more for organically grown food	0.602	0.645	0.745
Q3_2 I avoid consuming food with GMO (genetically modified organism)	0.590	0.632	0.794
Q3_3 I prefer to consume eco-label food	0.596	0.665	0.781
Q3_4 I am careful not to consume too much meat	0.613	0.687	0.803
Q3_5 I prefer to buy dairy products from local producers	0.601	0.674	0.704
Q3_6 I avoid consuming imported food such as a variety of exotic fruits	0.552	0.641	0.762
Q3_7 I avoid consuming canned "ready-made" food	0.568	0.662	0.740

limited and hence not representative of all Turkish households. Larger sample sizes could give more evidence in the generalizability of results. Furthermore, it would be interesting to apply the study with the same constructs to other countries or cultures. It could also be worthwhile to assess data using PLS-SEM, to determine further impacts, including the potential effects of demographic variables.

Our findings also shed light on one of the mechanisms through which households' characteristics may affect environmentally responsible food choice. Future research can build upon this relationship by examining other aspects of households' environmentally responsible food choice in addition to environmental knowledge. Moreover, the partial mediation of environmental concern suggests that there may be other behaviors that households endorse to improve environmentally responsible food choice. Hence, researchers may investigate other mechanisms, such as purchase intention and environmental education, to explain the environmental knowledge-environmentally responsible food choice relationship.

Conclusions

The analysis in this paper shows that the effect of households' environmental knowledge on environmentally responsible food choice is enhanced via the mediator variable (i.e. environmental concern). The application of PLS-SEM in this study provides a great depth of insight into the effect pathway that shows how households' environmental concern and environmental knowledge affect their environmentally responsible food choices. It is found that households' environmental knowledge is essential for forming environmentally responsible food choices, while their environmental concerns are direct and indirect additional drivers of a growing environmentally responsible food choice.

Compliance with Ethical Standards

Conflict of interest

The authors declare that for this article they have no actual, potential or perceived the conflict of interests.

Author contribution

The contribution of the authors is equal. All the authors read and approved the final manuscript. All the authors verify that the Text, Figures, and Tables are original and that they have not been published before.

Ethical approval

Not applicable.

Funding

No financial support was received for this study.

Data availability

Not applicable.

Consent for publication

Not applicable.

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